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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,898	06/07/2005	Michael S Griffith	540-567	9225
23117	7590	11/06/2006	EXAMINER	
NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203			SPINELLA, KEVIN	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 11/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/537,898

Applicant(s)

GRIFFITH ET AL.

Examiner

James C. Jones

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 06/07/2005.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file .

### ***Claim Objections***

2. Claims 10-21 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 10, sets forth a deformable mount and a deformable mirror as in claim 1, however claim 1 only sets forth a deformable mirror. Claim 20, sets forth a claim to a method, however claim 1 sets forth a claim to an apparatus. A method claim cannot depend from an apparatus claim. The applicant may overcome this rejection by simply amending the claims to make claims 10 and 20 independent.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

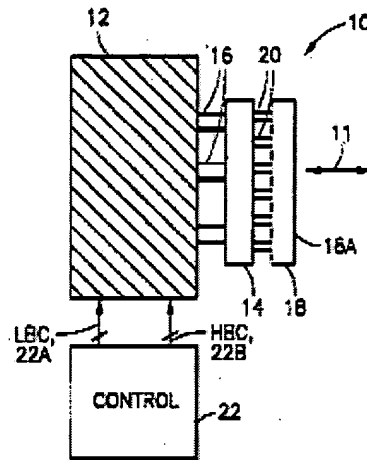
4. Claims 1-9, and 20 rejected under 35 U.S.C. 102(b) as being anticipated by Shen USP 6236490 hereafter '490.

In regards to **claim 1** '490 teaches a deformable mirror[10](see column 3 line 39) comprising

a reflective element[18A](see column 4 line 23 and figure 2) provided on a passive substrate[18](see column 4 line 23 and figure 2);

a layer of actively deformable material(i.e. the deformable material may be considered to be either the array of actuators[20](see column 4 line 50 or the intermediate structure[14](see column 3 line 61-62 and figure 2)) attached to the passive substrate that is operable to deform the mirror as a result of transverse expansion of the intermediate structure[14] (material) under the influence of a field across it's thickness(i.e. the intermediate structure[14] can be an ultra low expansion(ULE) material that is deformed when the electric signal(field) from the controller[20] passes to actuators[16] across the intermediate structures[14] thickness to the array of actuators [20])(see column 3 lines 49-53 and lines 61-64) ; and wherein

the substrate[18] is supported by an actuator[16] that is operable to deform the mirror(see column 3 lines 63-64 and figure 2).



Regarding **claim 2** '490 teaches an array of actuators[20](actively deformable material) bonded to the mirror facesheet[18](passive substrate layer)(see column 5 lines 1-3 and figure 2).

Regarding **claim 3** '490 teaches a second layer of deformable material bonded to the passive substrate layer(see figure 2).

Regarding **claim 4** '490 teaches a plurality of actuators coupled to at least one of the layers(see column 3 lines 60-64 and figure 2).

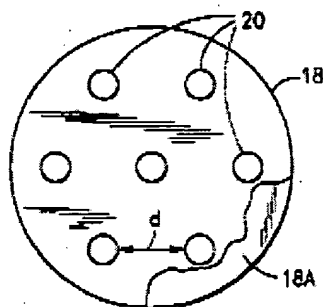
Regarding **claim 5** '490 teaches the actuators are arranged to correct lower order Zernike modes(i.e. lower frequency wavefront errors)(see column 4 lines 1-4).

Regarding **claim 6** '490 teaches the first or second layer of deformable material are segmented to be able to correct higher order Zernike modes(i.e. higher frequency wavefront errors)(see column 2 lines 18-24).

Regarding **claim 7** '490 teaches the actively deformable material comprise piezoelectric material(**PZT**)(see column 3 line 44).

Regarding **claim 8** teaches the actuators are coupled directly to the passive substrate layer by means of one or more apertures in the first or second layer or layers of actively deformable material(see figures 3B and 3B).

Top View



**FIG.3A**

Regarding **claim 9** '490 teaches electrostrictive material(**PMN**)(see column 3 lines 44).

Regarding **claim 20** '490 teaches a method of correcting phase variations, wherein actuators[**16**] are moved to correct Zernike modes at or below a threshold order(i.e. lower frequency wavefront errors) and the deformable material(the layer formed of an array of actuators[**20**] is moved to correct Zernike modes above the threshold order(i.e. higher frequency wavefront errors)(see column 6 lines 13-17).

Regarding claim 21 '490 teaches the first and second set of actuator are operated to deform to correct first and second order Zernike modes(see column 6 lines 13-17) and the deformable element(central actuator) can be deformed to correct third and higher Zernike modes(see figure 3A).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 10-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shen USP 6236490 hereafter '490 as applied to claim 1 above in view of Bacich USP 4733945 hereafter '945.

The cited primary reference teaches a deformable mirror[10](see column 3 line 39) comprising

a reflective element[18A](see column 4 line 23 and figure 2) provided on a substrate[18](see column 4 line 23 and figure 2);

a layer of deformable material(the deformable material may be considered to be either the array of actuators[20](see column 4 line 50 or the intermediate structure[14](see column 3 line 61-62 and figure 2)) attached to the substrate that is operable to deform the mirror and wherein the substrate[18] is supported by an actuator[16] that is operable to deform the mirror(see column 3 lines 63-64 and figure 2).

The cited primary reference does not teach a deformable mirror holder comprising

a body with a central aperture for receiving the deformable mirror,

a plurality of flexible beams, with a supporting surface and flexible portion.

The added secondary reference teaches a deformable mirror holder with a central aperture(see figure 1) wherein the mirror is supported by a plurality of cantilevered flexures(flexible beams) having one end shaped to provide a supporting surface[29](see column 4 line 13 and figures 2 and 4) and a flexure[22](flexible portion) that connects to the mounts body(see column 17 lines 9-14 and figures 2b and 4) which, is readable on the claimed feature of a plurality of flexible beams having one end shaped for a supporting surface and a flexible portion that connects to the mounts body. This yields the benefit of providing stability to the lens as it deformed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a deformable mirror holder as taught in '945, in the apparatus set forth in '848, to support the mirror firmly, for the benefit of providing stability to the mirror as it is deformed to various positions.

In regards to **claim 11** '945 teaches wherein the ends of flexible beams are co-joined to form a unitary structure to provide a supporting surface(see figure 4).

Regarding **claim 12** '945 teaches the ends of the beams lie in the plane of the body to receive the mirror within the holder(see figures 2A and 4).

Regarding **claim 13** '945 teaches a L-shaped support beam(see figure 4) such that one leg of the L-shaped provides the flexure[52](flexible portion)and lens seat[29] provides the supporting surface(see column 5 lines 4-5, and column 6 60-66 and figure 4).

Regarding **claim 14** '945 teaches the internal corner of the L-shaped support beam has a shoulder[25] that extends along both legs and supports the mirror from the side(see figures 2A, 2B, and 4).

Regarding **claim 15** '945 teaches a plurality of flexible beams arranged around the entire aperture(see figures 2A, 3, and column 4 lines 13).

Regarding **claim 18** '490 teaches the mirror is support from below by one leg of the L-shaped beam(lens seat[29])and is supported from the side by the other leg of the L-shaped beam[52](see figure 4).

Regarding **claim 19** '490 teaches the peripheral edge of the mirror is supported from below by the lens seat[29] and is supported from the side by an inwardly facing side of the shoulder[25](see figures 2A).

7. **Claims 16 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shen USP 6236490 in view of Bacich USP 4733945 as applied to claim 15 above, and further in view of Lafiandra USP 6848070 hereafter '070.

In regards to **claims 16 and 17** the previous combination remains as applied above; however, the previous combination does not teach the claimed width of the beams being larger than the separation between beams or does it teach the width of the beams being larger than the separation between beams.

The added '070 reference teaches an improved deformable mirror wherein the back plate[14] and flexures[18] have a gap in between them(see figure 1), the back plate and flexures are formed from the same piece of material(see column 2 lines 57-58). '070 teaches that the width of the back plate[14] and flexures[18] is at least four times the size of the gap between them(see figure 1). The width of the beams are greater than the gaps between them for the benefit of a highly stabilize deformable mirror.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included wider flexible support beams as taught in '070, in the apparatus set forth in the previous combination, to

support the mirror for the benefit of having a highly stabilize deformable mirror during the process of deformation.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Gaber et al. USP6388823, Plante et al. USP 4655563, Feinleib et al. USP 3904274, and Merz et al. USP 6307688.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James C. Jones whose telephone number is (571) 270-1278. The examiner can normally be reached on Monday thru Friday, 8 a.m. to 5 p.m. est. time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Angela Ortiz can be reached on (571)272-1206. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

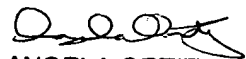
Application/Control Number:  
10/537,898  
Art Unit: 2891

Page 12

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JCJ

*Jane C. Jones* 10/26/2006

  
ANGELA ORTIZ  
SUPERVISORY PATENT EXAMINER

10/30/06